

WHAT IS CLAIMED IS:

*Suff B'*

1. A method of controlling a print operation of an ink jet printer, comprising the steps of:  
determining a print head temperature; and  
controlling a capping sequence based on the determined print head temperature.

10 2. A method according to Claim 1, wherein the determining step is repeated.

15 3. A method according to Claim 1, wherein the determining step is performed once before the controlling step.

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20 4. A method of controlling a print operation of an ink jet printer, comprising the steps of:  
cooling a print head using a predetermined method; and  
capping the print head after the print head is cooled.

25 5. A method according to Claim 4, wherein the cooling step causes ink droplets to be ejected from the print head.

30 *Suff*

6. A method according to Claim 5, wherein the ink droplets are ejected at a frequency lower than a frequency used for printing.

*Am. A'*

35 7. A method of controlling a print operation of an ink jet printer, comprising the steps of:  
printing an image using a print head; and

*Cont'd  
Sect. A'*

cooling the print head after the end of the printing operation using a predetermined method.

5        8. A method according to Claim 7, wherein the cooling step causes ink droplets to be ejected from the print head.

10      *Sect. A'* 9. A method according to Claim 8, wherein the ink droplets are ejected at a frequency lower than a frequency used for printing.

15      10. A method of controlling a print operation of an ink jet printer, comprising the steps of:

15      obtaining a parameter corresponding to a print head temperature when the ink jet printer is down; and

20      performing a predetermined process based on the parameter.

20      11. A method according to Claim 10, wherein the parameter is obtained by a calculation, without using a measured actual temperature.

25      12. A method according to Claim 10, wherein the parameter is obtained directly from a measured actual temperature.

30      13. A method according to Claim 10, wherein the predetermined process occurs in a next print job performed by the ink jet printer.

35      14. A method according to Claim 10, wherein the predetermined process occurs at a next power-on for the ink jet printer.

15. A method according to Claim 10,  
wherein the predetermined process occurs at an end  
of a current print job.

5           16. A method according to Claim 10,  
wherein the predetermined process is determined  
based on whether a print head is capped or not.

10          17. A method according to Claim 10,  
wherein the predetermined process comprises changing  
a number of ink droplets ejected before a print job.

15          18. A method according to Claim 10,  
wherein the predetermined process comprises purging  
ink from the print head.

19. A method of cooling a print head of an  
ink jet printer before capping, comprising the steps  
of:

20          determining an ambient temperature;  
              determining a print head temperature after  
receipt of last print data for a print job;  
              waiting a predetermined time after receipt  
of the last print data for the print job;  
25          after waiting the predetermined time,  
ejecting a predetermined number of ink droplets from  
nozzles of the print head at a frequency lower than  
a frequency used for printing;  
              determining a drop in print head  
30          temperature caused by ejecting the predetermined  
number of ink droplets; and  
              repeating the steps of waiting a  
predetermined time and ejecting a predetermined  
number of ink droplets until the print head  
35          temperature falls below a threshold.

20. A method according to Claim 19,  
wherein the ambient temperature is determined by  
using a diode disposed in the ink jet printer.

5           21. A method according to Claim 19,  
wherein the print head temperature after receipt of  
the last print data for the print job is determined  
by using a calculation based on a number of ink  
droplets ejected from the print head during the  
10          print job.

15          22. A method according to Claim 19,  
wherein the print head temperature after receipt of  
the last print data for the print job is determined  
by using a diode disposed on the print head.

20          23. A method according to Claim 19,  
wherein the predetermined time for waiting after  
receipt of the last print data for the print job is  
between nine and twelve seconds.

25          24. A method according to Claim 19,  
wherein the predetermined number of ink droplets  
ejected from nozzles of the print head is thirty per  
nozzle.

30          25. A method according to Claim 19,  
wherein the frequency that the predetermined number  
of droplets are ejected from the print head is  
approximately two kilohertz, and the frequency used  
for printing is at least five kilohertz.

35          26. A method according to Claim 19,  
wherein the drop in print head temperature caused by  
ejecting the predetermined number of ink droplets is  
determined by using a calculation based on the  
predetermined number of ink droplets ejected and the

frequency that the ink droplets are ejected from the print head.

5           27. A method according to Claim 19,  
wherein the drop in print head temperature caused by  
ejecting the predetermined number of ink droplets is  
determined by using a diode disposed on the print  
head.

10           28. A method according to Claim 19,  
further comprising the step of purging ink from the  
print head in a case that the method of Claim 19 is  
interrupted before the print head temperature has  
fallen below the threshold.

15           29. A method of cooling a print head of an  
ink jet printer, comprising the step of repeatedly  
ejecting a predetermined number of ink droplets from  
nozzles of the print head at a frequency lower than  
20           a frequency used for printing, with a pause between  
each repetition, until a predetermined threshold is  
reached.

25           30. An apparatus for controlling a print  
operation of an ink jet printer, comprising:  
*Suff B5*  
              a memory including a region for storing  
              executable process steps;  
              a processor for executing the executable  
              process steps; and  
              an interface between the processor and a  
              print head of the ink jet printer that allows the  
              processor to control firing of nozzles of the print  
              head,  
              wherein the executable process steps  
30            include steps of: (a) determining a print head  
              temperature; and (b) controlling a capping sequence  
              based on the determined print head temperature.

31. An apparatus according to Claim 30,  
wherein the determining step is repeated.

5       32. An apparatus according to Claim 30,  
wherein the determining step is performed once  
before the controlling step.

10      33. An apparatus for controlling a print  
operation of an ink jet printer, comprising:  
          a memory including a region for storing  
          executable process steps;  
          a processor for executing the executable  
          process steps; and  
          an interface between the processor and a  
15      print head of the ink jet printer that allows the  
          processor to control firing of nozzles of the print  
          head,  
          wherein the executable process steps  
          include steps of: (a) cooling the print head using  
20      a predetermined method; and (b) capping the print  
          head after the print head is cooled.

25      34. An apparatus according to Claim 33,  
          wherein the cooling step causes ink droplets to be  
          ejected from the print head.

30      35. An apparatus according to Claim 34,  
          wherein the ink droplets are ejected at a frequency  
          lower than a frequency used for printing.

35      36. An apparatus for controlling a print  
operation of an ink jet printer, comprising:  
          a memory including a region for storing  
          executable process steps;  
          a processor for executing the executable  
          process steps; and

~~an interface between the processor and a print head of the ink jet printer that allows the processor to control firing of nozzles of the print head,~~

5           ~~wherein the executable process steps include steps of: (a) printing an image using the print head; and (b) cooling the print head after the end of the printing operation using a predetermined method.~~

10           ~~37. An apparatus according to Claim 36, wherein the cooling step causes ink droplets to be ejected from the print head.~~

15           ~~38. An apparatus according to Claim 37, wherein the ink droplets are ejected at a frequency lower than a frequency used for printing.~~

20           ~~39. An apparatus for controlling a print operation of an ink jet printer, comprising:  
a memory including a region for storing executable process steps;  
a processor for executing the executable process steps; and~~

25           ~~an interface between the processor and a print head of the ink jet printer that allows the processor to control firing of nozzles of the print head,~~

30           ~~wherein the executable process steps include steps of: (a) obtaining a parameter corresponding to a print head temperature when the ink jet printer is down; and (b) performing a predetermined process based on the parameter.~~

35           ~~40. An apparatus according to Claim 39, wherein the parameter is obtained by a calculation, without using a measured actual temperature.~~

41. An apparatus according to Claim 39, wherein the parameter is obtained directly from a measured actual temperature.

5 42. An apparatus according to Claim 39, wherein the predetermined process occurs in a next print job performed by the ink jet printer.

10 43. An apparatus according to Claim 39, wherein the predetermined process occurs at a next power-on for the ink jet printer.

15 44. An apparatus according to Claim 39, wherein the predetermined process occurs at an end of a current print job.

20 45. An apparatus according to Claim 39, wherein the predetermined process is determined based on whether the print head is capped or not.

46. An apparatus according to Claim 39, wherein the predetermined process comprises changing a number of ink droplets ejected before a print job.

25 47. An apparatus according to Claim 39, wherein the predetermined process comprises purging ink from the print head.

30 48. An apparatus for controlling cooling of a print head of an ink jet printer before capping, comprising:

a memory including a region for storing executable process steps;

35 a processor for executing the executable process steps; and

an interface between the processor and a print head of the ink jet printer that allows the

processor to control firing of nozzles of the print head,

wherein the executable process steps include steps of: (a) determining an ambient temperature; (b) determining a print head temperature after receipt of a last print data for a print job; (c) waiting a predetermined time after receipt of the last print data for the print job; (d) after waiting the predetermined time, ejecting a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing; (e) determining a drop in print head temperature caused by ejecting the predetermined number of ink droplets; and (f) repeating the steps of waiting a predetermined time and ejecting a predetermined number of ink droplets until the print head temperature falls below a threshold.

49. An apparatus according to Claim 48, wherein the ambient temperature is determined by using a diode disposed in the ink jet printer.

50. An apparatus according to Claim 48, wherein the print head temperature after receipt of the last print data for the print job is determined by using a calculation based on a number of ink droplets ejected from the print head during the print job.

51. An apparatus according to Claim 48, wherein the print head temperature after receipt of the last print data for the print job is determined by using a diode disposed on the print head.

52. An apparatus according to Claim 48, wherein the predetermined time for waiting after

receipt of the last print data for the print job is between nine and twelve seconds.

5               53. An apparatus according to Claim 48,  
wherein the predetermined number of ink droplets ejected from nozzles of the print head is thirty per nozzle.

10              54. An apparatus according to Claim 48,  
wherein the frequency that the predetermined number of droplets are ejected from the print head is approximately two kilohertz, and the frequency used for printing is at least five thousand hertz.

15              55. An apparatus according to Claim 48,  
wherein the drop in print head temperature caused by ejecting the predetermined number of ink droplets is determined by using a calculation based on the predetermined number of ink droplets ejected and the frequency that the ink droplets are ejected from the print head.

20              56. An apparatus according to Claim 48,  
wherein the drop in print head temperature caused by ejecting the predetermined number of ink droplets is determined by using a diode disposed on the print head.

25              57. An apparatus according to Claim 48,  
further comprising the step of purging ink from the print head in a case that the process steps of Claim 48 are interrupted before the print head temperature has fallen below the threshold.

30              58. An apparatus for controlling cooling a print head of an ink jet printer, comprising:

a memory including a region for storing executable process steps;

a processor for executing the executable process steps; and

5 an interface between the processor and a print head of the ink jet printer that allows the processor to control firing of nozzles of the print head;

10 wherein the executable process steps include the step of repeatedly ejecting a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing, with a pause between each repetition, until a predetermined threshold is reached.

20 *Suit B9*  
59. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:

code to determine a print head temperature;  
and

25 code to control a capping sequence based on the determined print head temperature.

30 60. Computer-executable process steps according to Claim 59, wherein the code to determine a print head temperature is executed repeatedly.

35 *Suit B9*  
61. Computer-executable process steps according to Claim 59, wherein code to determine a print head temperature is executed once before the code to control the capping sequence.

62. Computer-executable process steps stored on a computer-readable medium, the computer

*Sub B1*

executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:

5 code to cool a print head using a predetermined method; and

code to cap the print head after the print head is cooled.

10 63. Computer-executable process steps according to Claim 62, wherein the code to cool the print head causes ink droplets to be ejected from the print head.

*Sub B1*

15 64. Computer-executable process steps according to Claim 63, wherein the ink droplets are ejected at a frequency lower than a frequency used for printing.

*Sub A3*

20 65. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:

25 code to print an image using a print head; and

code to cool the print head after the end of the printing operation using a predetermined method.

30 66. Computer-executable process steps according to Claim 65, wherein the code to cool the print head causes ink droplets to be ejected from the print head.

*Sub B1*

35 67. Computer-executable process steps according to Claim 66, wherein the ink droplets are

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ejected at a frequency lower than a frequency used  
for printing.

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5 68. Computer-executable process steps  
stored on a computer-readable medium, the computer  
executable process steps to control a print  
operation of an ink jet printer, the computer-  
executable process steps comprising:

10 code to obtain a parameter corresponding to  
a print head temperature when the ink jet printer is  
down; and

code to perform a predetermined process  
based on the parameter.

15 69. Computer-executable process steps  
according to Claim 68, wherein the parameter is  
obtained by a calculation, without using a measured  
actual temperature.

20 70. Computer-executable process steps  
according to Claim 68, wherein the parameter is  
obtained directly from a measured actual  
temperature.

25 71. Computer-executable process steps  
according to Claim 68, wherein the predetermined  
process occurs in a next print job performed by the  
ink jet printer.

30 72. Computer-executable process steps  
according to Claim 68, wherein the predetermined  
process occurs at a next power-on for the ink jet  
printer.

35 73. Computer-executable process steps  
according to Claim 68, wherein the predetermined  
process occurs at an end of a current print job.

74. Computer-executable process steps according to Claim 68, wherein the predetermined process is determined based on whether a print head is capped or not.

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75. Computer-executable process steps according to Claim 68, wherein the predetermined process comprises changing a number of ink droplets ejected before a print job.

10

76. Computer-executable process steps according to Claim 68, wherein the predetermined process comprises purging ink from the print head.

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77. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to control cooling of a print head of an ink jet printer before capping, the computer-executable process steps comprising:

20

code to determine an ambient temperature;  
code to determine a print head temperature after receipt of a last print data for a print job;

code to wait a predetermined time after receipt of the last print data for the print job;

25

code to eject a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing;

code to determine a drop in print head temperature caused by ejecting the predetermined number of ink droplets; and

30

code to repeat execution of the code to wait a predetermined time and the code to eject a predetermined number of ink droplets until the print head temperature falls below a threshold.

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78. Computer-executable process steps according to Claim 77, wherein the ambient

temperature is determined by using a diode disposed in the ink jet printer.

79. Computer-executable process steps  
5 according to Claim 77, wherein the print head temperature after receipt of the last print data for the print job is determined by using a calculation based on a number of ink droplets ejected from the print head during the print job.

10 80. Computer-executable process steps  
according to Claim 77, wherein the print head  
temperature after receipt of the last print data for  
the print job is determined by using a diode  
15 disposed on the print head.

20 81. Computer-executable process steps  
according to Claim 77, wherein the predetermined time for waiting after receipt of the last print data for the print job is between nine and twelve seconds.

25 82. Computer-executable process steps  
according to Claim 77, wherein the predetermined  
number of ink droplets ejected from nozzles of the  
print head is thirty per nozzle.

30 83. Computer-executable process steps  
according to Claim 77, wherein the frequency that  
the predetermined number of droplets are ejected  
from the print head is approximately two kilohertz,  
and the frequency used for printing is at least five  
thousand hertz.

35 84. Computer-executable process steps  
according to Claim 77, wherein the drop in print  
head temperature caused by ejecting the

5 predetermined number of ink droplets is determined by using a calculation based on the predetermined number of ink droplets ejected and the frequency that the ink droplets are ejected from the print head.

10 85. Computer-executable process steps according to Claim 77, wherein the drop in print head temperature caused by ejecting the predetermined number of ink droplets is determined by using a diode disposed on the print head.

15 86. Computer-executable process steps according to Claim 77, further comprising code to purge ink from the print head in a case that the execution of the computer-executable process steps of Claim 77 are interrupted before the print head temperature has fallen below the threshold.

20 87. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to control cooling of a print head of an ink jet printer, the computer-executable process steps comprising code to repeatedly eject a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing, with a pause between each repetition, until a predetermined threshold is reached.

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*Mark B*  
35 88. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:  
a determining step to determine a print head temperature; and

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a controlling step to control a capping sequence based on the determined print head temperature.

- 5            89. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:
- 10            a cooling step to cool a print head using a predetermined method; and
- a capping step to cap the print head after the print head is cooled.
- 15            *JUL 17*    90. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:
- 20            a printing step to print an image using a print head; and
- a cooling step to cool the print head after the end of the printing operation using a predetermined method.
- 25            91. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control a print operation of an ink jet printer, the computer-executable process steps comprising:
- 30            an obtaining step to obtain a parameter corresponding to a print head temperature when the ink jet printer is down; and
- a performing step to perform a predetermined process based on the parameter.

92. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control cooling of a print head of an ink jet printer before capping, the computer-executable process steps comprising:

5 a first determining step to determine an ambient temperature;

10 a second determining step to determine a print head temperature after receipt of a last print data for a print job;

15 a waiting step to wait a predetermined time after receipt of the last print data for the print job;

20 an ejecting step to eject a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing;

25 a third determining step to determine a drop in print head temperature caused by ejecting the predetermined number of ink droplets; and

30 a repeating step to repeat the waiting step to wait a predetermined time and the ejecting step to eject a predetermined number of ink droplets.

35 93. A computer-readable medium which stores computer-executable process steps, the computer-executable process steps to control cooling of a print head of an ink jet printer, the computer-executable process steps comprising the step of repeatedly ejecting a predetermined number of ink droplets from nozzles of the print head at a frequency lower than a frequency used for printing, with a pause between each repetition, until a predetermined threshold is reached.